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Dietary patterns, assessed from a weighed food record, and survival among elderly participants from the United Kingdom

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Abstract

Background/Objectives—There is variability in the association between dietary intake and health outcomes across different countries, especially among the elderly. We used the gold standard dietary assessment method, a weighed food record, to examine the association between dietary pattern and mortality in a representative sample of community dwelling participants from Great Britain aged 65 years and older.

Subjects/Methods—Dietary intake was recorded at baseline in 1017 elderly participants (520 men, 497 women, mean age 76.3±7.4 years). Exploratory factor analysis was performed to examine dietary patterns and participants were followed up over an average of 9.2 years for mortality.

Results—The factor analysis revealed four interpretable principal components accounting for approximately 9.8% of the total variance, with similar patterns across sex. A ‘Mediterranean-style’ dietary pattern explained the greatest proportion of the variance (3.7%), followed by ‘health-aware’ (2.2%), ‘traditional’ (2.0%) and ‘sweet and fat’ (1.9%) factors. There were a total of 683 deaths through follow-up. After adjustment for potential confounders, only the Mediterranean-style dietary pattern remained associated with mortality (highest vs lowest tertile; hazard ratio=0.82, 95% CI, 0.68–1.00). The benefits of the Mediterranean-style diet were only observed among women (hazard ratio=0.71, 95% CI 0.52–0.96) although in men the traditional diet was a risk factor for mortality (hazard ratio=1.30, 95% CI 1.00–1.71).

Conclusions—Using a gold standard approach, our results confirm previous evidence that dietary patterns are important in longevity among the elderly.

Keywords

ageing; dietary pattern; longevity; nutritional epidemiology

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Introduction

Dietary patterns have been associated with various disease risk markers (Lopez-Garcia *et al.*, 2004; Nettleton *et al.*, 2006; Fargnoli *et al.*, 2008) and clinical end points such as incident coronary heart disease and diabetes (Hu *et al.*, 2000; van Dam *et al.*, 2002; Heidemann *et al.*, 2005; Brunner *et al.*, 2008; Fung *et al.*, 2008; Nettleton *et al.*, 2009), and some cancers (Schulz *et al.*, 2008). Few studies, however, have examined the long-term effect of dietary patterns on survival in the elderly. Data in elderly participants from nine European countries showed that an increase in the modified Mediterranean diet score (in which unsaturated fats were substituted with monounsaturated fats) was associated with 7% lower overall mortality (Trichopoulou *et al.*, 2005). In a large prospective study of older Europeans (60 years or older) adherence to a plant-based diet corresponded to a reduced risk of mortality in participants from Southern Europe although the association was absent in the United Kingdom and Germany (Bamia *et al.*, 2007). This finding may be explained by the observation that elderly participants from Northern Europe are more likely to consume a 'sweet and fat' dominated diet in contrast to vegetable-based diets of Southern Europeans (Bamia *et al.*, 2005). Other data from European cohort studies have been conflicting. For example, the Healthy Ageing study, comprising elderly participants from Finland, the Netherlands and Italy showed an association between adherence to Mediterranean diet and reduced risk of mortality (Knoops *et al.*, 2004), although in older Dutch women a traditional healthy dietary pattern, but not Mediterranean, was associated with lower risk (Waijers *et al.*, 2006). In a cohort of elderly Italian participants, a dietary pattern characterized by 'pasta and meat' was associated with higher mortality risk but an 'olive oil and salad' pattern was linked with longevity (Masala *et al.*, 2007). Some of these inconsistencies might be explained by differences in *a priori* and *a posteriori* approaches to defining dietary patterns.

Taken together, the existing findings suggest that there are major differences in lifestyle and mortality predictors between different countries. It is therefore advantageous to obtain more data in representative samples of the elderly that might facilitate the provision of better guidance on nutritional requirements in this group. The aim of this study was to examine the association between dietary pattern (defined *a posteriori*) and mortality in a representative sample of community dwelling participants from Great Britain aged 65 years and older. This study used the gold standard dietary assessment method of a weighed food record, which is rarely used in large-scale population studies.

Methods

Participants and study design

Data used in this study were derived from the National Diet and Nutrition Survey of people living in the community aged 65 years and over from mainland Britain (Finch, 1998). To take account of possible seasonal variations in eating habits, the survey was carried out in four successive 3-month fieldwork 'waves' corresponding approximately to the four seasons, from October 1994 to September 1995. Ethical approval for the survey was obtained from the local research ethics committees for each of the 80 randomly selected postcode sectors included in the survey (20 per 'wave'), and from the ethics committee of the Medical Research Council (MRC) Dunn Nutrition Unit, of which the Micronutrient Status Laboratory of MRC Human Nutrition Research was formerly a part. The procedures followed were in accordance with the ethical standards of the regional committee on human experimentation. Participants were followed up for death over an average of 9.2 years (ranging from 1 to 14.5 years) using linked NHS administrative mortality data (censored 30 September 2008). The sample was designed to consist of roughly equal numbers of men and women in the 65–74 and 74–84 age groups although there were fewer men aged 85 years and over, which is reflective of the general population. The survey response rate was 85%, and from the eligible sample of 2172 participants, 72% provided full interview data and 59% provided full diet records. Where the participant was unable to provide some or all of the information required, due to mental or physical infirmity, interviewers were instructed to collect information from another person that was typically another household member. A proxy provided information for 3% of participants, who were mostly aged 85 years and over. This analysis consisted of 1017 participants (520 men, 497 women, mean age 76.3±7.4 years) with complete data on dietary intake and who consented to mortality follow-up.

Assessment of dietary intake

Participants were requested to keep a 4-day weighed record of all food and drink consumed, which was found to produce acceptable levels of compliance and completion (Finch, 1998). Participants were issued with a Soehnle Quanta digital food scale to weigh food consumed at home, and details of any food and drink consumed outside were recorded in a separate diary so that interviewers could purchase duplicate items and weigh them. Interviewers subsequently coded each item using a food list of over 3500 items, and daily nutrient intakes were calculated by linking quantities of foods consumed with the nutrient databank compiled by the Ministry of Agriculture, Fisheries and Food (Finch, 1998). Related or similar foods/drinks were combined into 99 food/drink categories and the mean weekly intake of each category in grams was calculated for each participant. In addition, use of vitamin and mineral supplements (in the form of capsule, oil, drops) was recorded. To validate the dietary data, we collected fasting blood samples in a subsample of the participants for the analysis of plasma vitamin C, α- and β-vitamin E, α- and β-carotene. Detailed information on the methodology for the blood analysis, the internal quality control and the external quality assessment for the laboratory that carried it out can be retrieved from the technical report (Finch, 1998).

Sociodemographic and health-related measures

Highest educational qualifications were classified as those with Certificate of Secondary Education (GSE) or higher, or those with lower qualifications. Self-reported physical activity scores were derived from a series of questions designed to record the extent to which participants were physically active through exercise and sports, walking, housework and gardening. Their answers were classified according to the maximum intensity of physical activity for activities they claimed to carry out at least once a fortnight as: vigorous (activities including running or jogging), moderate (cycling, keep fit, 20 or more minutes of continuous walking at a brisk or fast pace), light (physiotherapy, dancing, golf, 20 or more minutes of continuous walking at a slow, steady or average pace) and inactive (none of the above). Scores were categorized as moderate-vigorous or light-inactive levels of physical activity. Current cigarette smoking status was categorized as smoker or nonsmoker. Nurses collected anthropometric data (weight, height) and information on medication use (Bates *et al*., 1999). Measured height and weight were used to compute body mass index (BMI=weight (kg)/square of height (m)). In addition, participants were asked to rate their health as 'very good', 'good', 'fair' or 'poor/bad'.

Statistical analysis

Exploratory factor analysis was performed using the method of principal components and varimax rotation on 99 food/drink categories (Mishra *et al*., 2004). Items with a factor loading of 0.25 or more were retained and any items that cross-loaded between factors were removed. Interreliability of each factor was assessed by Cronbach's α coefficients for standardized variables. We calculated factor scores for each participant, based on a mean of zero and a variance equal to the squared multiple correlation between the estimated factor scores and the true factor values. Analysis of variance tests were used to examine continuous

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variables and χ^2-tests for categorical variables in relation to the differences in characteristics within each dietary pattern score.

Cox proportional hazards models were used with years as the timescale to estimate the risk of mortality according to each dietary pattern. We examined cause specific mortality according to International Classification of Diseases—Version 9 (ICD-9) and 10 (ICD-10), including cardiovascular causes (ICD-9, 390–459; ICD-10, I01–I99), cancer (ICD-9, 140–239; ICD-10, C00–D48), and diseases of the respiratory system (ICD-9, 460–519; ICD-10, J00–J99). The data were censored to 30 September 2008 in participants that survived. The proportional hazards assumption was examined by comparing the cumulative hazard plots grouped on exposure, although no appreciable violations were noted. Multivariate models were adjusted for potential confounders including age, gender, education (≥GSE vs none), self-rated health as a categorical variable (very good, good, fair or poor/bad), smoking (current smoker or nonsmoker), physical activity (any moderate-vigorous or none), medication use (any or none), BMI, total energy intake (MJ/day), nutritional supplements (yes vs no) and mutual adjustment for all dietary patterns. All analyses were performed using SPSS (version 15).

Results

The age of sample ranged from 65 to 99 years (mean, 76.3±7.4 years), 65% reported ‘good’ or ‘very good’ health, 34.7% were in the normal weight range (BMI=18–25.0 kg/m^2) and smoking rates were relatively low (15.5%) at baseline.

Results of the factor analysis revealed four interpretable principal components (Table 1), all with eigenvalues above 1, which was confirmed by the examination of a scree plot. Interpretation of the dietary patterns was consistent with previous work (Pryer *et al.*, 2001b; Hamer and Mishra, 2009). Because similar components were identified for men and women in gender-stratified analysis, we present combined data for both sexes. The four factors accounted for approximately 9.8% of the total variance. A ‘Mediterranean-style’ dietary pattern appeared to explain the greatest proportion of the variance (see Table 1), followed by a ‘health-aware’ pattern. The Mediterranean-style pattern largely consisted of fruits and raw vegetables, oily fish, coffee and wine, whereas the health-aware pattern consisted more of low-fat/high fiber foods, such as boiled potatoes, green vegetables and wholemeal bread. The traditional pattern consisted of foods commonly found in the British diet such as white bread, eggs, bacon and ham, but healthier foods such as wholemeal bread, semi-skimmed milk and yogurt were negatively associated with this pattern. Both the Mediterranean-style and health-aware dietary pattern scores were positively associated with a number of blood nutrient biomarkers, whereas the traditional dietary pattern scores were inversely associated (see Appendices A and B), which supports the validity of our dietary measures.

There were notable differences in several characteristics in relation to dietary patterns (Table 2). Younger participants were more likely to consume items from the Mediterranean-style and health-aware dietary patterns although a ‘sweet and fat’ dietary pattern was positively associated with age. Gender was not associated with a Mediterranean dietary pattern, although a lower proportion of women consumed other dietary patterns including health aware, traditional, and sweet and fat. Higher education was associated with consuming foods from Mediterranean-style, health-aware and sweet and fat dietary patterns, but less likely to consume items from the traditional factor. Health indicators and lifestyle habits were generally better in Mediterranean-style, health-aware and sweet and fat dietary patterns, and worse in the traditional.

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There were a total of 383 deaths in men and 300 deaths in women (183 cardiovascular, 136 cancer, 108 respiratory system cause specific deaths) over an average of 8.5 and 10.0 years of follow-up in men and women, respectively. Independent predictors of all-cause mortality included smoking (hazard ratio (HR)=1.46, 95% confidence interval (CI), 1.17–1.83), poor self-rated health (HR=1.68, 95% CI 1.19–2.37), medication use (HR=1.25, 95% CI 1.06–1.46) and female gender (HR=0.55, 95% CI 0.45–0.56). In relation to dietary patterns, there was an association between Mediterranean-style diet pattern and lower risk of mortality that persisted after multivariate adjustments (Table 3). In simple age- and sex-adjusted models, there were associations between health-aware and sweet and fat dietary pattern with lower mortality, and a traditional diet was related to higher mortality risk. These associations were, however, substantially attenuated in the multivariate model and therefore can be largely explained through residual confounding. In analyses stratified by age, the Mediterranean-style diet pattern was more protective among younger (≤75 years, n=510) participants (multivariate adjusted HR=0.70, 95% CI 0.51–0.97) compared with those >75 years (HR=0.88, 95% CI 0.69–1.14). There was significant gender interaction in relation to the Mediterranean and traditional dietary patterns (P<0.001). In gender-stratified analyses, the Mediterranean-style dietary pattern was only protective among women (HR=0.71, 95% CI 0.52–0.96), although the traditional diet was a risk factor for mortality in men only (HR=1.30, 95% CI 1.00–1.71). We also examined dietary patterns in relation to specific causes of death, although no significant associations were observed (data not shown). Because chronic disease might have influenced dietary intake, we performed sensitivity analyses to exclude the possibility of reverse causation. After excluding 48 deaths in the first year of follow-up and a further 46 participants who rated their health as 'very poor' at baseline, the association between Mediterranean dietary pattern and survival remained unchanged (age- and sex-adjusted HR for highest third=0.74, 95% CI 0.60–0.90).

Discussion

This study used weighed food records to investigate dietary patterns in a representative sample of community dwelling participants from Great Britain aged 65 years and older and their associations' with all-cause mortality. The dietary pattern scores were strongly correlated with a number of nutrient biomarkers in the blood, which supports the validity of our dietary measures. We are not aware of any other large epidemiological studies that have used the gold standard dietary assessment method of a weighed food record in this age group. We identified a Mediterranean-style dietary pattern characterized by salad and raw vegetables, fruit, oily fish, nuts and seeds and wine, which was inversely associated with a reduced risk of all-cause mortality, and remained significantly associated with mortality after adjustment for a range of confounders. Although the health-aware, traditional and sweet and fat dietary patterns all showed associations with mortality, these associations disappeared after adjustment in the full multivariate models.

The dietary patterns identified in this elderly population are similar to those identified in younger British adults (16–64 years) surveyed in 1986–1987 (Pryer *et al.*, 2001b) and more contemporary populations of British adults of low socioeconomic position (Hamer and Mishra, 2009), with the traditional dietary pattern and the Mediterranean-style pattern consistently emerging, although the latter was only present among women in the 1986–1987 sample (Pryer *et al.*, 2001b). Our traditional and health-aware patterns were also similar to those identified in this elderly population using cluster analysis (Pryer *et al.*, 2001a). The dietary patterns present in this UK elderly population also share similarities with those in other European elderly populations (Bamia *et al.*, 2005; Pala *et al.*, 2006).

Similar to our results, a study of Italian adults aged over 60 years identified two dietary patterns that may be considered healthy (Pala *et al.*, 2006; Masala *et al.*, 2007). They identified a Mediterranean-style dietary pattern rich in olive oil, raw vegetables, soups and poultry (olive oil and salad) and a second healthy, style dietary pattern (labeled ‘prudent’) that was rich in cooked vegetables, legumes, fish and seed oils. They also found that the Mediterranean-style pattern was associated inversely with mortality while the prudent pattern was not. Although the dietary patterns from different countries do exhibit some similarities, there are notable differences, which make comparison sometimes difficult. The common component of the aforementioned dietary patterns with this study is salad or raw vegetables. Previous research among the British population has highlighted the association between salad vegetable consumption and better health outcomes (Cox *et al.*, 2000; Myint *et al.*, 2007). Our findings also support those of Knoops *et al.* (2004), which investigated the Mediterranean diet among adults aged 70–90 years using a diet score covering legumes, nuts, grains, fruit, vegetables and fish and showed a lower risk of mortality among those with the greatest compliance with the Mediterranean diet.

In our study, we identified a traditional dietary pattern rich in white bread, beer, sugar, processed meat and a sweet and fat pattern rich in butter, whole milk, cream, cakes and puddings, which were not associated with all-cause mortality. This is consistent with findings from Masala *et al.* (2007) who also used factor analysis and identified a pattern rich in red and processed meat and white bread and a pattern rich in cakes, butter and milk, neither of which showed associations with mortality. However, among German elderly subjects, Hoffmann *et al.* (2005) used reduced rank regression techniques to determine a dietary pattern that predicted energy intake from a range of macronutrients and identified a pattern characterized by red meat, processed meat, poultry, eggs, butter and sauces, which was associated with a higher risk of mortality. It is unclear whether these differences relate to methodological differences or true difference between populations across Europe.

A major strength of this study relates to the dietary assessment method used. Most population studies of dietary patterns have used food-frequency questionnaires rather than food diaries and when food diaries are used, smaller sample sizes are common (Newby *et al.*, 2004). There are moderate correlations between food-frequency questionnaires and food diaries when used to derive various dietary patterns (Khani *et al.*, 2004). However, although many food-frequency questionnaires have been validated, they nevertheless suffer from considerable measurement error. In this study, diet was measured using a weighed food record that provides detailed information regarding the types of food and beverage consumed and is considered a gold standard in dietary assessment providing an estimate of usual intake.

Further strengths of this study include the nationally representative sample of community dwelling adults, the prospective study design and the rigorous methods of outcome ascertainment. All deaths are required to be registered with the local authority within 5 days of occurrence in England, Wales and Northern Ireland and within 8 days in Scotland. In addition, we investigated a range of factors as potential confounding factors, such as sociodemographic factors (age, sex, education), health behaviors (smoking, physical activity), biomedical risk factors (BMI), energy intake, medication use, dietary supplement use and self-rated health. While the associations between mortality and the health-aware, traditional and sweet and fat dietary patterns were no longer significant after adjustment, associations for the Mediterranean style dietary pattern remained significant. However, we cannot rule out the possibility of residual confounding due to other factors that were not measured in this study or the presence of measurement error in the existing confounders.

One of the criticisms of dietary patterns analysis is the potential subjective nature of the analytical approach, including the groupings of foods. Although there is little methodological research in the area, the impact of the number of food groups used has been

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investigated by others (McCann *et al.*, 2001). In this study, the results of dietary pattern analysis using factor analysis using 36 broad food groups and 168 (mostly) single food items were compared and although the number and type of dietary patterns did not change, the relationship between the dietary patterns and disease risk was substantially attenuated when using the broad food groups, suggesting that greater detail in food groupings is required when investigating associations with health outcomes.

A limitation of this study is the lack of information about dietary patterns earlier in the life course, which may be an important influence on health (McNaughton *et al.*, 2007). We showed in a sample of British adults that healthy dietary patterns showed stronger tracking throughout adult life compared to other patterns such as the traditional dietary patterns (Mishra *et al.*, 2006). Therefore, measures of current healthy patterns may more adequately reflect longer term consumption of the dietary pattern, and hence may partially explain why the Mediterranean-style dietary pattern showed the strongest results with all-cause mortality. Another potential limitation of the study is the low percent of variance explained by the four dietary patterns. However, because 'the percent variance explained' is a function of the number of food items included in the factor analysis, it is more appropriate to use it a relative measure to compare the performance of each dietary pattern within the same study.

Worldwide, it is well recognized that the population is ageing and that this will have significant economic and social impacts (Christensen *et al.*, 2009). Nutritional needs change during older age with the required intakes of certain nutrients increasing whereas energy requirements decrease (Department of Health, 1991). Therefore, the quality of diet with food choices based on nutrient-dense foods becomes increasingly important. Later adulthood is a critical period for promotion of nutrition as chronic disease will present during this life stage, there are immediate benefits to improving chronic disease risk profiles and there is an ability to maximize health by avoiding or delaying preventable disability. This research adds to the existing evidence that dietary patterns are important in longevity among the elderly. Further research is required to confirm whether dietary patterns may also improve functional status, in addition to longevity.

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Appendix

Appendix A:

Spearman's rank correlation coefficients between dietary pattern score and blood nutrient biomarkers.

Blood biomarker	Mediterranean	Health aware	Traditional	Sweet and fat
Vitamin C (*n*=852)	0.37**	0.23**	−0.16**	0.11*
α-Vitamin E (*n*=799)	0.11*	0.09*	−0.13**	−0.07

Blood biomarker	Mediterranean	Health aware	Traditional	Sweet and fat
γ-Vitamin E (*n*=792)	0.04	−0.11	0.01	−0.03
α-Carotene (*n*=788)	0.22 **	0.24 **	−0.13 **	0.07
β-Carotene (*n*=798)	0.15 **	0.15 **	−0.16 **	0.15 **

* $P<0.01$;

** $P<0.001$.

Appendix B:

Original food and drink categories

Pasta
Rice
Pizza
Other cereals
Bread—white
Bread—wholemeal
Soft grain bread
Other bread
Breakfast cereals—wholegrain and high fiber
Breakfast cereals—other
Biscuits
Fruit pies
Buns, cakes and pastries
Cereal-based milk puddings
Sponge-type puddings
Other puddings containing cereal
Milk—whole
Milk—semi-skimmed
Milk—skimmed
Cream (including imitation cream)
Other milk
Cottage cheese
Other cheese
Fromage frais
Yogurt
Other dairy desserts
Ice cream
Eggs
Egg dishes
Butter
Polyunsaturated margarine
Polyunsaturated oils

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Polyunsaturated low fat spread

Low-fat spread not polyunsaturated

Block margarine

Soft margarine not polyunsaturated

Other cooking fats and oils not polyunsaturated

Reduced fat spread (polyunsaturated)

Reduced fat spread (not polyunsaturated)

Bacon and ham

Beef, veal and dishes

Lamb and dishes

Pork and dishes

Chicken—coated

Chicken and turkey dishes

Liver and dishes, liver pate and liver sausage

Burgers and kebabs

Sausages

Meat pies and pastries (including chicken pies)

Meat—other meat products

Fish—white, coated or fried (including fish fingers)

Shellfish

Other white fish and fish dishes

Fish—oily (including canned)

Carrots (raw)

Salad and other vegetables (raw)

Tomatoes (raw)

Peas (not raw)

Green beans (not raw)

Baked beans

Leafy green vegetables (including broccoli) (not raw)

Carrots (not raw)

Tomatoes (not raw)

Vegetable dishes

Other vegetables

Potato chips

Fried or roast potatoes and fried potato products

Potato products, not fried

Potatoes—other (boiled, baked), potato salads

Crisps and savory snacks

Apples and pears (not canned)

Citrus fruit (not canned)

Bananas

Canned fruit in juice

Canned fruit in syrup

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Other fruit
Nuts and seeds (including fruit and nut mixes)
Sugar
Preserves
Sweet spreads, fillings and icing
Confectionery—sugar
Confectionery—chocolate
Drinks—fruit juice
Soft drinks, not diet
Diet soft drinks
Liqueurs
Spirits
Wine
Fortified wine
Low alcohol and alcohol free wine
Beers and lagers
Low alcohol and alcohol free beer and lager
Cider and perry
Low alcohol and alcohol free cider and perry
Coffee (made-up weight)
Tea (made-up weight)
Herbal tea (made-up weight)
Bottled water, still or carbonated, not sweetened
Tap water only
Beverages (dry weight)
Soups
Savory sauces, pickles, gravies and condiments

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Table 1

Dietary patterns and factor loadings of specific food items (*n*=1017)

Food items	Factor loading	Mean±s.d. (g/week)
Factor 1: Mediterranean (3.7%, α=0.46)		
Water (tap)	0.62	1981.6±2158.1
Coffee	0.54	1011.7±1406.9
Salad and raw vegetables	0.50	80.4±149.3
Apples and pears	0.34	198.0±300.2
Oily fish	0.34	65.5±137.1
Nuts and seeds	0.32	5.7±34.6
Wine	0.31	90.7±343.7
Bananas	0.30	132.4±203.5
Other fruit	0.30	149.3±291.0
Fruit juice	0.30	159.7±383.6
Factor 2: Health aware (5.9%, α=0.13)		
Potatoes (boiled, baked)	0.49	513.1±397.7
Carrots (cooked)	0.46	69.2±114.8
Leafy green vegetables	0.43	116.9±162.2
Other vegetables	0.33	174.9±212.2
Wholemeal bread	0.30	180.3±291.7
Semi-skimmed milk	0.30	681.3±1059.8
Chicken and turkey dishes	0.30	130.6±213.2
Whole milk	−0.35	810.8±1103.9
Potato chips	−0.30	130.4±202.7
Factor 3: Traditional (7.9%, α=0.12)		
White bread	0.60	377.7±376.8
Beers and lager	0.38	644.1±2064.1
Sugar	0.36	101.8±156.5
Eggs	0.30	99.4±125.0
Bacon and ham	0.30	97.4±122.2
Pork dishes	0.30	55.5±128.2
Other meat products	0.30	47.7±113.2
Wholemeal bread	−0.37	180.3±291.7
Yogurt	−0.31	88.9±218.0
Semi-skimmed milk	−0.30	681.3±1059.8
Factor 4: Sweet and fat (9.8%, α=0.07)		
Butter	0.43	45.9±74.9
Whole milk	0.40	810.8±1103.9
Preserves	0.36	58.6±88.4
Cream	0.35	17.9±52.3
Buns, cakes, pastries	0.35	210.1±222.1
Sponge type puddings	0.32	10.5±53.0

Food items	Factor loading	Mean±s.d. (g/week)
Chocolate	0.30	22.8±58.0

Cumulative percentage and Cronbach's α is shown in brackets.

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Table 2

Characteristics of participants by dietary patterns (*n*=1017)

Diet pattern	Age (years, mean±s.d.	Gender (% women)	Education (% none)	Self-rated health (% poor/bad)	Medication use (% taking medication)	Current smokers (%)	Physical activity (% inactive)	Energy intake (MJ/day, mean±sd)	Waist/hip ratio (mean±s.d.)	Body mass index (kg/m^2, mean±s.d.)	Supplement use (%)
Mediterranean											
Lowest third	78.2±7.7	49.9	75.2	6.8	42.2	19.8	20.4	1590±460	0.89±0.08	26.1±4.7	18.2
Middle third	76.5±7.0	51.5	64.5	5.3	47.9	12.7	16.0	1619±403	0.89±0.09	26.6±4.1	23.3
Highest third	74.2±6.9	45.3	45.0	3.5	50.6	14.1	14.4	1759±518	0.88±0.09	26.7±4.0	26.0
P-value for trend	<0.001	0.248	<0.001	0.319	0.081	0.028	0.101	<0.001	0.284	0.114	0.045
Health aware											
Lowest third	77.5±7.4	56.5	65.2	6.8	46.9	23.0	18.0	1584±471	0.89±0.07	26.2±4.7	19.9
Middle third	76.8±7.5	52.1	61.5	4.7	48.5	13.0	16.3	1600±457	0.88±0.10	26.3±4.2	20.4
Highest third	74.7±7.0	38.2	57.9	4.1	45.3	10.6	16.5	1784±451	0.89±0.09	26.8±3.9	27.2
P-value for trend	<0.001	<0.001	0.152	0.002	0.702	<0.001	0.807	<0.001	0.614	0.111	0.039
Traditional											
Lowest third	75.8±7.2	62.5	56.0	2.7	49.6	7.1	12.3	1567±431	0.87±0.09	26.6±4.2	24.7
Middle third	77.6±7.9	57.4	63.3	5.3	46.4	14.5	18.0	1566±451	0.88±0.09	26.3±4.3	27.5
Highest third	75.5±6.8	26.8	65.3	7.6	44.7	25.0	20.2	1833±472	0.91±0.07	26.5±4.4	15.5
P-value for trend	<0.001	<0.001	0.033	0.013	0.439	<0.001	0.018	<0.001	<0.001	0.599	<0.001
Sweet and fat											
Lowest third	74.9±7.1	50.9	71.3	6.8	49.1	20.1	16.2	1474±442	0.89±0.08	26.9±4.6	20.8
Middle third	76.8±7.5	52.9	63.5	5.6	50.3	15.6	20.6	1587±412	0.89±0.08	26.7±4.5	24.0
Highest third	77.3±7.3	42.8	49.9	3.2	41.2	10.9	13.9	1907±440	0.88±0.09	25.7±3.7	22.8
P-value for trend	<0.001	0.020	<0.001	0.014	0.039	0.004	0.061	<0.001	0.80	0.001	0.585

Table 3

Cox proportional hazards models for dietary patterns and mortality (*n*=1017)

Diet pattern	Deaths/N	Age/sex-adjusted HR (95% CI)	Fully adjusted HR (95% CI)
Mediterranean			
Lowest	259/339	1.00	1.00
Medium	221/338	0.79 (0.66–0.94)	0.81 (0.67–0.97)
Highest	203/340	0.74 (0.61–0.89)	0.82 (0.68–1.00)
P-trend		0.003	0.044
Health aware			
Lowest	247/339	1.00	1.00
Medium	232/338	0.93 (0.78–1.12)	1.04 (0.86–1.25)
Highest	204/340	0.80 (0.66–0.97)	0.93 (0.76–1.13)
P-trend		0.069	0.532
Traditional			
Lowest	209/339	1.00	1.00
Medium	220/338	0.99 (0.82–1.20)	0.94 (0.78–1.15)
Highest	254/340	1.23 (1.02–1.50)	1.15 (0.94–1.40)
P-trend		0.037	0.143
Sweet and fat			
Lowest	217/338	1.00	1.00
Medium	231/340	0.96 (0.79–1.15)	1.02 (0.84–1.24)
Highest	235/339	0.78 (0.64–0.94)	0.93 (0.75–1.15)
P-trend		0.017	0.622

Fully adjusted model contains age, sex, education (≥GSE including O-level/A-level or none), self-rated health (very good, good, fair, poor/bad), smoking (current smoker or nonsmoker), physical activity (any moderate-vigorous or none), medication (any or none), body mass index, total energy intake (MJ/day), supplements, mutual adjustment for all diet patterns.